NEL®
CI0411

Preliminary

DUAL 2x2 MATRIX SWITCH

Features

- Wideband operation: DC - 12 GHz or DC - 12.5Gb/s
- Arbitrary I/O Level: SCFL, CML, PECL, etc.
- Insertion loss: < 3 dB TYP. (DC - 12 GHz)
- High isolation: > 20 dB TYP. (DC - 12 GHz)
- Switching speed: < 0.5ns
- Interactive I/O interface

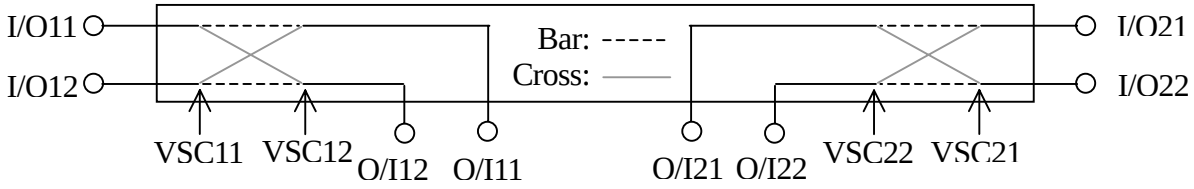
General Description

The CI0411 is a DUAL 2x2 MATRIX SWITCH operating at frequency from DC to 12 GHz. The arbitrary I/O levels, i.e. positive or negative in addition to AC-coupling signals are acceptable. The IC is fabricated using a 0.1-μm InP HEMT process. The CI0411 is provided in a 28-lead hermetically-sealed package.

Applications

- 12.5 Gb/s SONET/SDH
- 10 Gb/s Ethernet
- Wideband Wireless System
- 10 Gb/s Measurement Systems
- Add/Drop Multiplexer

Block Diagram



Truth Table

VSC11	VSC12	Status	I/O11 to O/I11, I/O12 to O/I12	I/O11 to O/I12, I/O12 to O/I11
VSC21	VSC22		I/O21 to O/I21, I/O22 to O/I22	I/O21 to O/I22, I/O22 to O/I21
L	H	Bar	Low Loss	Isolated
H	L	Cross	Isolated	Low Loss

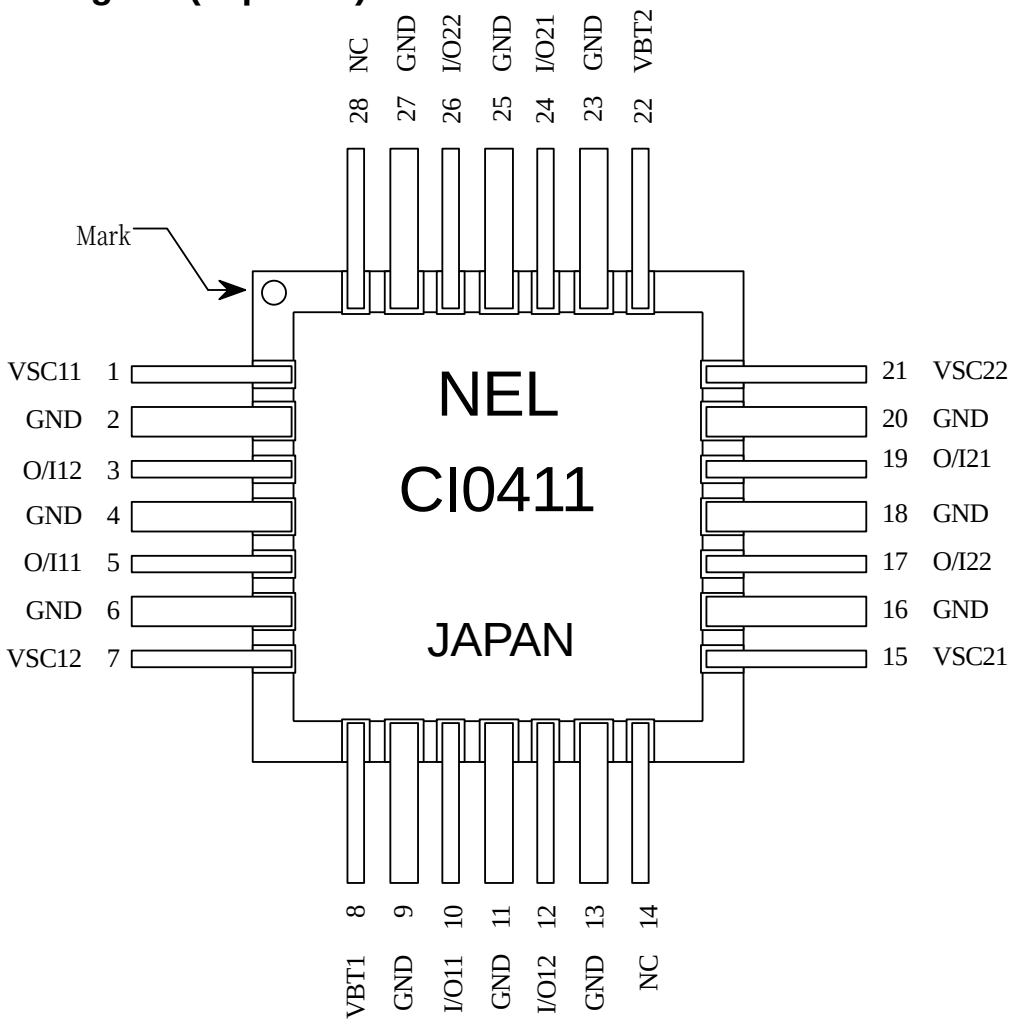
Connection Table

No.	NAME	FUNCTION	No.	NAME	FUNCTION
1	VSC11	Switching Control Voltage 11	15	VSC21	Switching Control Voltage 21
2	GND	Ground (0.0 V)	16	GND	Ground (0.0 V)
3	O/I12	Signal OUT/IN 12	17	O/I22	Signal OUT/IN 22
4	GND	Ground (0.0 V)	18	GND	Ground (0.0 V)
5	O/I11	Signal OUT/IN 11	19	O/I21	Signal OUT/IN 21
6	GND	Ground (0.0 V)	20	GND	Ground (0.0 V)
7	VSC12	Switching Control Voltage 12	21	VSC22	Switching Control Voltage 22
8	VBT1 (1)	I/O Bias control Voltage 1	22	VBT2 (1)	I/O Bias control Voltage 2
9	GND	Ground (0.0 V)	23	GND	Ground (0.0 V)
10	I/O11	Signal IN/OUT 11	24	I/O21	Signal IN/OUT 21
11	GND	Ground (0.0 V)	25	GND	Ground (0.0 V)
12	I/O12	Signal IN/OUT 12	26	I/O22	Signal IN/OUT 22
13	GND	Ground (0.0 V)	27	GND	Ground (0.0 V)
14	NC	No Internal Connection	28	NC	No Internal Connection

Notes

(1) Normally open

Connection Diagram (Top View)



Absolute Maximum Ratings

SYMBOL	PARAMETER	RATING	UNIT
VSCH	Switching Control High Level Voltage (VSC11, VSC12, VSC21, VSC22)	0.0 ～ Vih [2] + 0.2	V
VSCL	Switching Control Low Level Voltage (VSC11, VSC12, VSC21, VSC22)	Vih [2] - 2.4 ～ 0.0	V
Vin	Applied Voltage Amplitude at Signal Input (I/O11, I/O12, I/O21, I/O22, O/I11, O/I12, O/I21, O/I22)	0.0 ～ 1.2	Vpp
VBT	I/O Bias control Voltage (VBT1, VBT2)	TBD	V
Tstor	Storage Temperature	TBD	°C
Tc[1]	Case Temperature under Bias	TBD	°C

TBD: To Be Determined

Recommended Operating Conditions

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
VSCH	Switching Control High Level Voltage (VSC11, VSC12, VSC21, VSC22)		Vih [2]		V
VSCL	Switching Control Low Level Voltage (VSC11, VSC12, VSC21, VSC22)		Vil [3] - 0.9		V
VBT	I/O Bias Voltage at AC Coupling (VBT1, VBT2)	Normally Open			

AC Characteristics

($Tc^{(1)}$ = 30 °C)

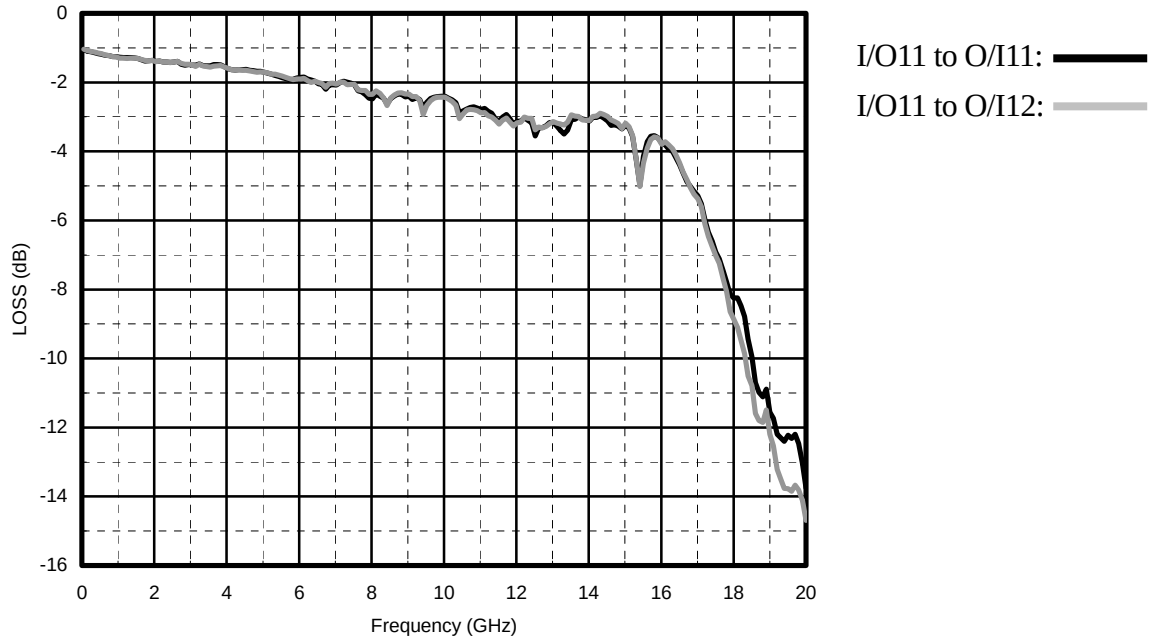
SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
f_{MAX}	Maximum Input Frequency	12			GHz
Din_{MAX}	Maximum Input Data Rate	12.5			Gb/s
Vin	Applied Voltage Amplitude at Signal Input			1.2	Vpp
Los	Loss at 12 GHz		3	TBD	dB
Iso	Isolation at 12 GHz		- 20	TBD	dB

TBD: To Be Determined

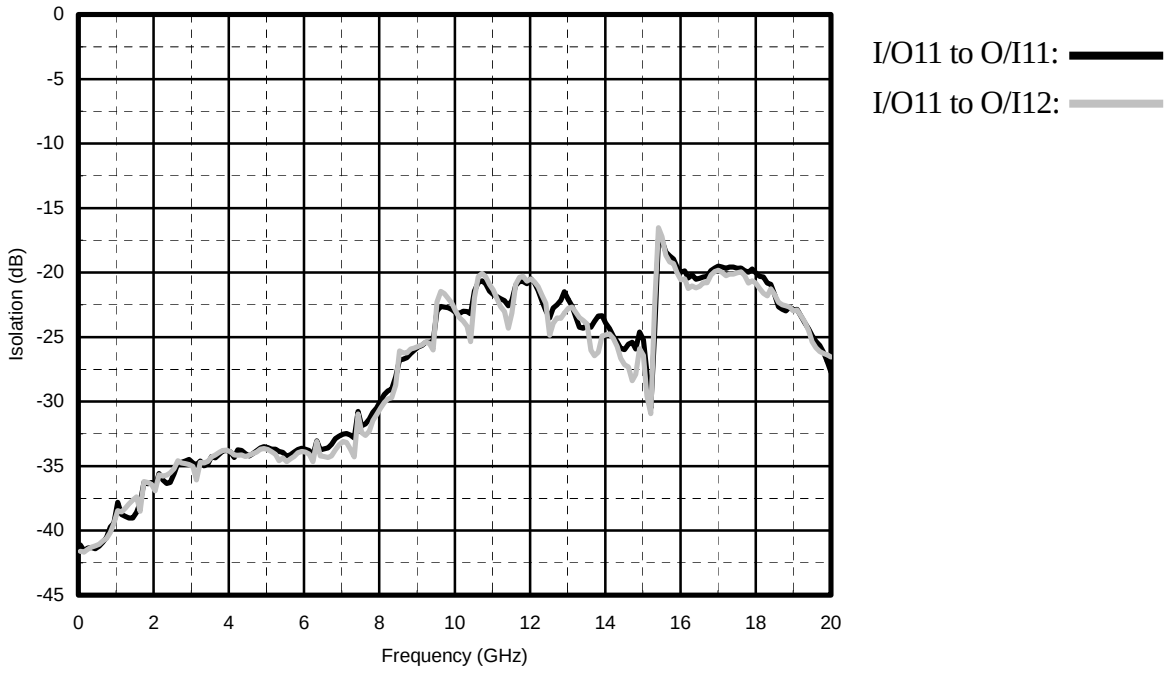
Note

(1) Tc: Temperature at package base.
(2) Vih: Signal Input High Level Voltage.
(3) Vil: Signal Input Low Level Voltage.

Sample Loss Characteristics (I/O11 to O/I11: Bar, I/O11 to O/I12: Cross)



Sample Isolated Characteristics (I/O11 to O/I11: Bar, I/O11 to O/I12: Cross)



Measurement Conditions

Pin= -10 dB, Port1 Attenuation =0 dB, Port2 Attenuation =0 dB

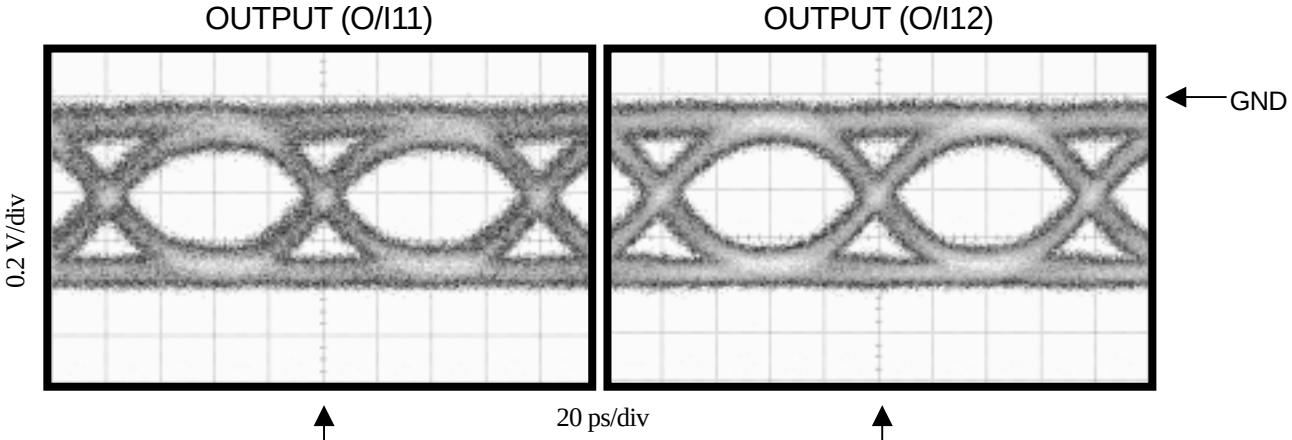
Status Bar: VSC11= -1.5 V, VSC12= 0.0 V

Status Cross: VSC11= 0.0 V, VSC12= -1.5 V

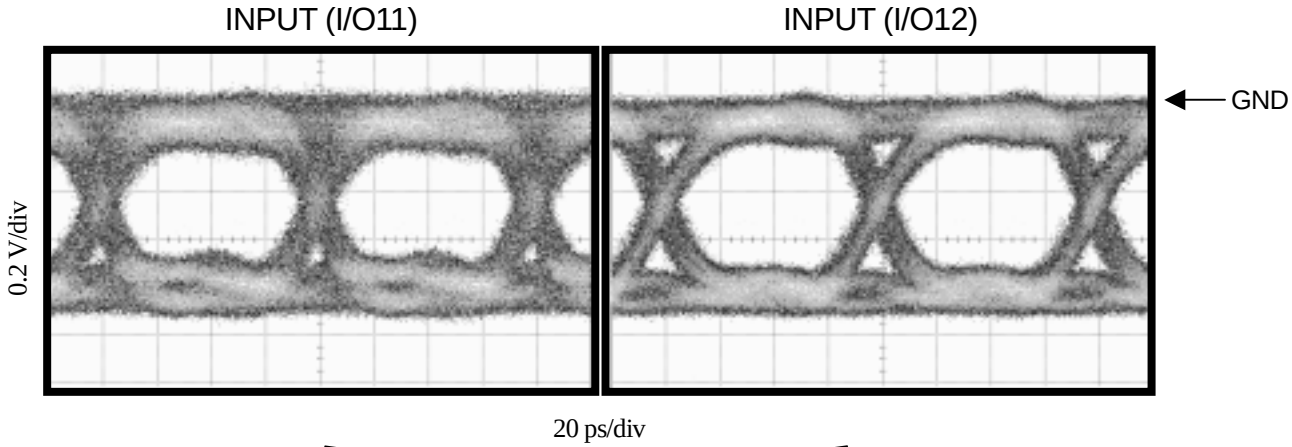
Results given here were obtained using the NEL conventional test fixture.

Sample Output Waveforms

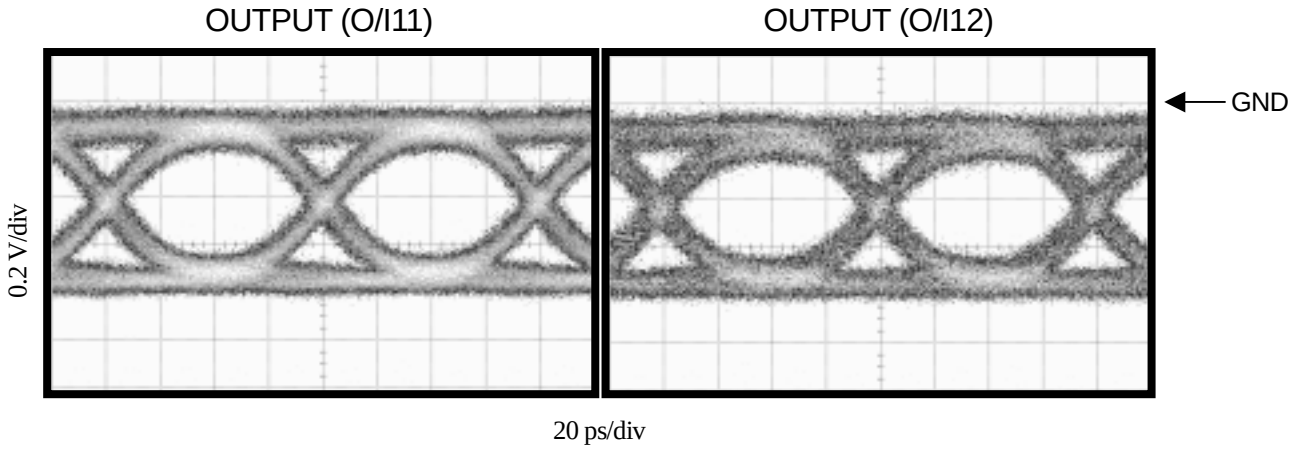
Status: Bar



Input



Status: Cross



Measurement Conditions

I/O11, I/O12: 12.5 Gb/s, PN=31, MR=1/2, SCFL level

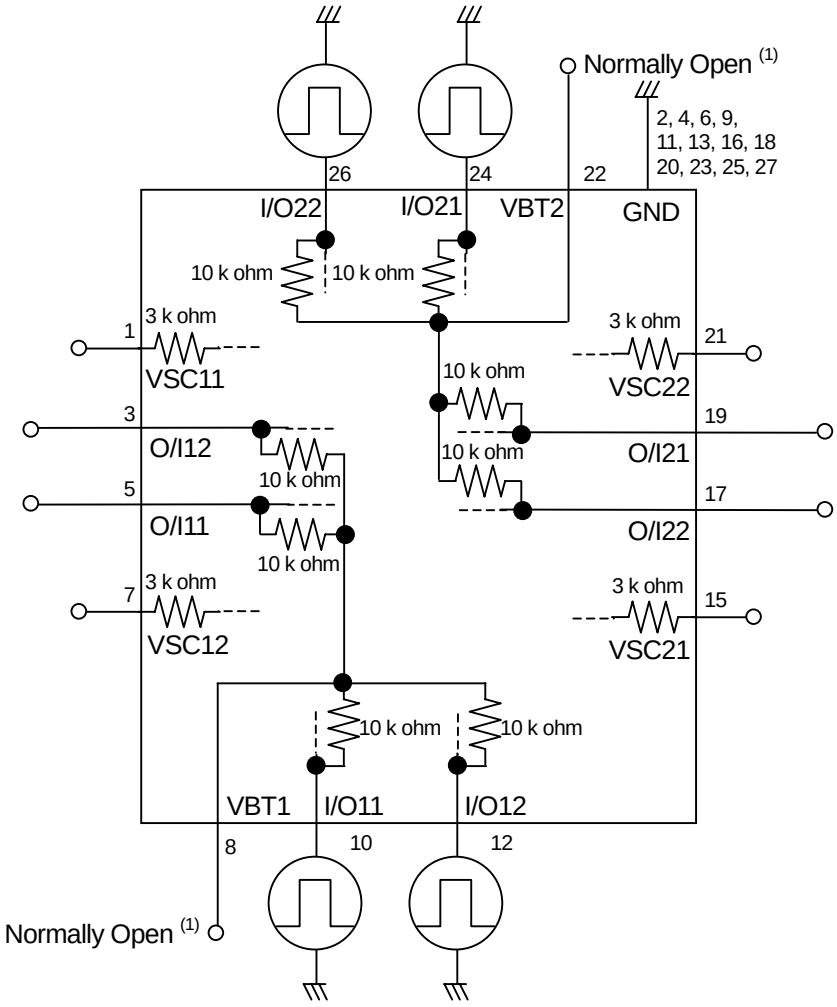
Status Bar: VSC11= -1.5 V, VSC12= 0.0 V

Status Cross: VSC11= 0.0 V, VSC12= -1.5 V

Results given here were obtained using the NEL conventional test fixture.

Sample Implementation

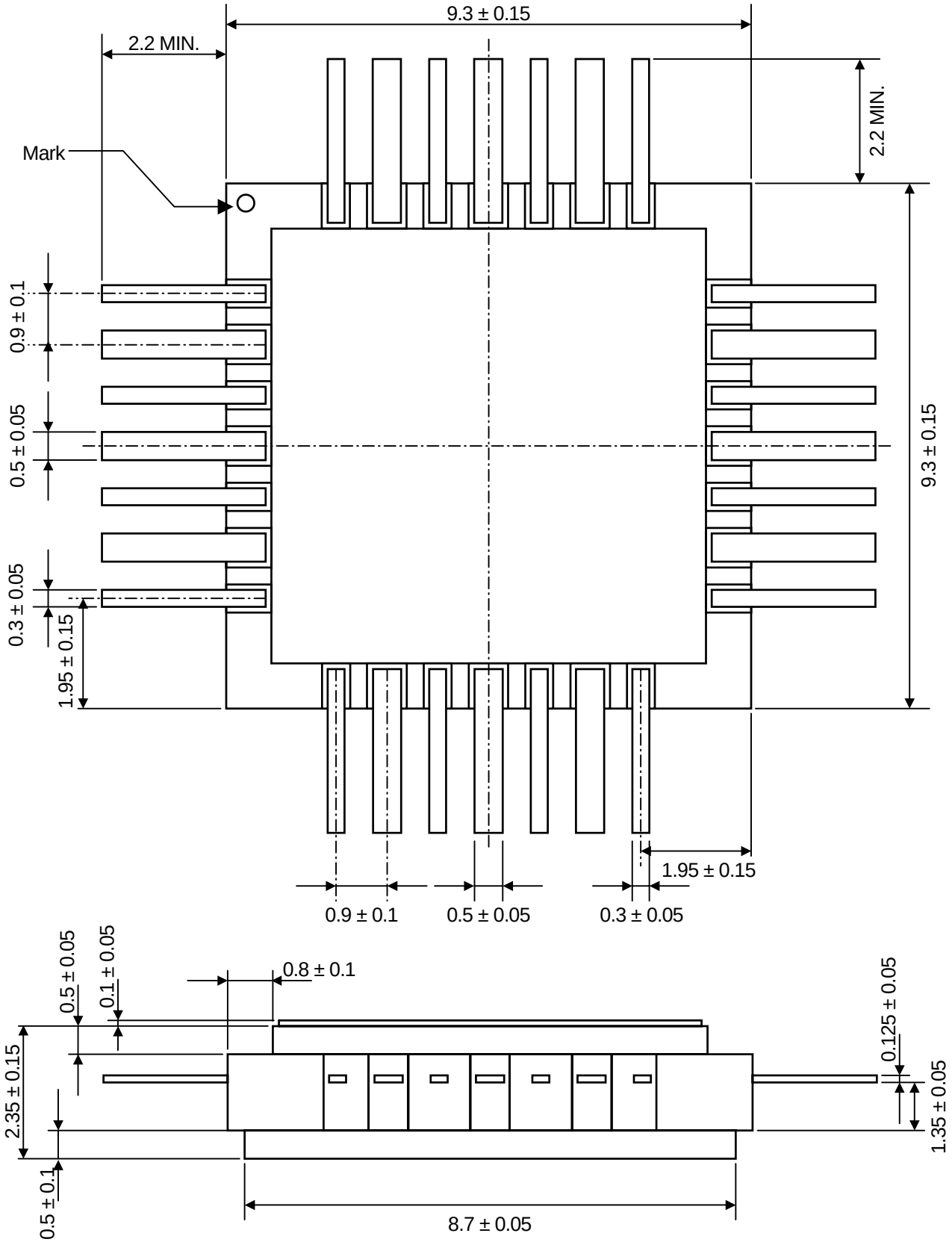
Note: Each number corresponds to a pin as shown in Connection Diagram.



Note

(1) DC Coupling: Open
AC Coupling: Set the bias voltage to VBT terminal pin

TB28 Package Dimension (mm)



Handling Instructions

Since the IC is fabricated using InP HEMT process, users are recommended to follow the power supply sequence and the instructions below to prevent damage to the chip from electro-static discharge.

(1) Handling Instructions

1) Use a conductive working desk connected to the ground (or, a conductive table top connected to the ground).
2) Require all handling personnel to wear a conductive bracelet or wrist-strap connected to the ground through a 1 M ohm resistor.
3) Ground all test equipment.
4) Ground all soldering iron tops.
5) Store IC's and other devices such as chip capacitors in their conductive carriers until they are soldered.
6) Use power supplies that do not generate over-voltages such as spikes. Many power supplies generate over-voltages when their outputs are turned on or turned off.

Caution

1. In order to improve products and technology, specifications are subject to change without notice.
2. When using the products, be sure the latest information and specifications are used.
3. Circuit drawings etc. shall be provided for the purpose of information only on application examples not for actual installation of equipment. NTT Electronics Corp. shall not assume any liability for damage that may result from the use of these circuit drawings etc. NTT Electronics Corp. shall not assent to or guarantee any rights of execution for patent rights of the third parties and other rights that may be raised for use of these circuit drawings.
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